ABSTRACT:

In this research, to predict the product yields of a pilot scale VGO hydrocracking reactor charged with mono functional hydrotreating and hydrocracking catalysts, two different four-lump models are developed. The first one, called combined bed model, is a simplex in which there is no boundary between hydrotreating and hydrocracking reactions through the reactor. The second one, called dual bed model, is a rigorous model in which hydrogen consumption and hydrotreating reactions are included. In this way, the reactor is subdivided into two different layers, so the effect of hydrotreating reactions on the hydrocracking section can be considered. Results show that the absolute average deviation (AAD%) of the yield prediction for the combined bed and the dual bed models are 8.23 percent and 5.87 percent, respectively. The main reason for the lower average deviation of the dual bed model is its higher accuracy to predict the yield of gas which is also the major advantage of this approach. However, the simplicity of the combined bed model can make it more applicable and attractive, especially when hydrogen consumption as well as sulfur, nitrogen and aromatic specifications of the feed and products are not accessible.